MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

BEF3014 – ECONOMETRICS MODELLING & FORECASTING

(All sections / Groups)

2 MARCH 2016
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** questions in **FIVE (5)** printed pages.
2. Answer **ALL** questions in the answer booklet provided.
3. Show all calculation workings in the answer booklet.
4. Marks are shown at the end of each question.

Question 1

(a) Explain the following error measures:

(i) In-sample (2 marks)

(ii) Out-of-sample (2 marks)

(b) Suppose the following is the monthly total sales data for McNonald Company in year 2013.

Month	Sales (in RM thousand)
Jan	23.9
Feb	15.6
Mar	17.5
Apr	22.9
May	12.9
Jun	32.6
Jul	14.5
Aug	33.8
Sep	26.8
Oct	17.9
Nov	23.9
Dec	36.8

(i) Use four-term moving average to generate one-step-ahead forecasts for May until December 2013. (4 marks)

(ii) Based on the data above, forecast the McNonald Company's total sales from May to December 2013 using the simple exponential smoothing method (assume $\alpha = 0.33$). (8 marks)

(iii) Compute MAE and RMSE for each forecasting method in part (i) and (ii). (6 marks)

(iv) Based on part (iii), suggest and explain which forecasting method performs better. (3 marks)

[Total marks: 25 marks]

Continued...

Question 2

Consider the following aggregated demand function for residential housing in Serdang for the period 1991 - 2014:

$$\widehat{Y}_t = 34.89 - 4.56\,X_{1t} + 12.78\,X_{2t} + 2.25\,X_{3t} + 28.94\,X_{4t}$$
$$(0.0156)\quad (0.0344)\quad (0.0012)\quad (0.0892)\quad (0.1529)$$

R-squared = 0.9747 F-statistic = 340.89 (0.0001)

where Y = Residential housing sold
X_1 = Price of residential house in Serdang (RM in thousands)
X_2 = Annual personal income (RM in thousands)
X_3 = Interest rate (in percentage)
X_4 = Employed civilian labor force (thousands)

The values in the parentheses are the probability values.

(a) Perform the individual test for each independent variable and discuss its significance in explaining the residential housing sold at 5% significance level. (8 marks)

(b) Perform the validity test of the overall model at 1% significance level. (4 marks)

(c) Given that X_1 = 35.4, X_2 = 5.5, X_3 = 4.5, and X_4 = 4.7 in 2015, generate the forecast values of Y in 2015. (3 marks)

(d) From the forecasted Y in part (c), create a 90% prediction interval for 2015. Assume the estimated standard error is 0.246. (4 marks)

(e) Based on part (d), if the actual residential housing sold is 38, does it surprise you? (3 marks)

(f) As to verify the reliability of the regression, discuss **THREE (3)** necessary diagnostic checking on the residual. (3 marks)

[Total marks: 25 marks]

Question 3

(a) Explain the following tests:

(i) Unit root (3 marks)

(ii) Cointegration (3 marks)

Continued...

(b) Consider the following unit root test results for the number of airline passengers (PAX), income of the passengers (INCOME), the price of the airline tickets (PRICE), and the trading activities between countries (TRADE) with trend and intercept:

Variable	Level	First Difference
PAX	-3.0583 (0.1300)	-5.5293 (0.0003)
INCOME	-2.3134 (0.4174)	-4.6732 (0.0029)
PRICE	-2.0576 (0.5532)	-5.5862 (0.0002)
TRADE	-5.0012 (0.0012)	-4.9587 (0.0014)

The values in parentheses are the probability values of the t-statistics.

(i) Identify the stationary order for each of the variable . (4 marks)

(ii) Do you able to proceed to the cointegration test using all variables such as PAX, INCOME, PRICE, and TRADE? Explain. (6 marks)

(iii) Below is the EViews output of Johansen Cointegration test:

Date: 12/01/15 Time: 12:36
Sample (adjusted): 1964 2002
Included observations: 39 after adjustments
Trend assumption: Linear deterministic trend
Series: PAX INCOME PRICE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.162007	10.89843	29.79707	0.9636
At most 1	0.083991	4.005335	15.49471	0.9031
At most 2	0.014860	0.583881	3.841466	0.4448

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Continued...

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.162007	6.893090	21.13162	0.9580
At most 1	0.083991	3.421454	14.26460	0.9148
At most 2	0.014860	0.583881	3.841466	0.4448

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Is there any cointegration vector between PAX, INCOME, and PRICE? Suggest an appropriate model to regress the relationship between PAX, INCOME, and PRICE. Explain. (6 marks)

(iv) Consider the following EViews output of Granger-Causality test:

Pairwise Granger Causality Tests
Date: 12/01/15 Time: 15:11
Sample: 1961 2002
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INCOME does not Granger Cause PAX	40	0.49431	0.6142
PAX does not Granger Cause INCOME		4.90523	0.0132
PRICE does not Granger Cause PAX	40	1.36675	0.2682
PAX does not Granger Cause PRICE		1.11484	0.3393
PRICE does not Granger Cause INCOME	40	4.45560	0.0189
INCOME does not Granger Cause PRICE		0.96996	0.3891

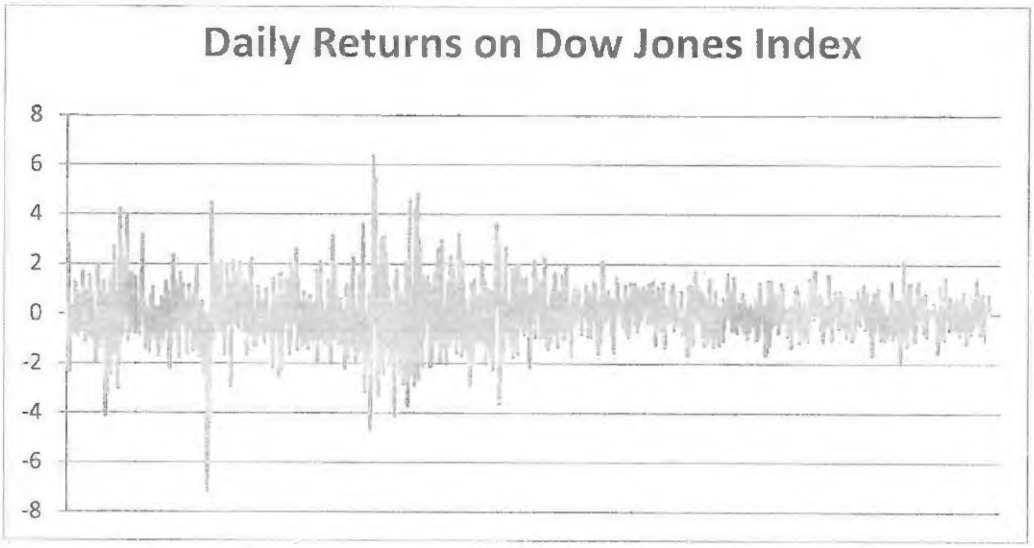
Identify whether there is any Granger-Causality effect between PAX, INCOME, and PRICE? (3 marks)

[Total marks: 25 marks]

Continued...

Question 4

(a) Below is the plot of daily returns on Dow Jones Index from 2007 to 2010:



(i) What did you observed from the plot above? (4 marks)

(ii) Suggest **TWO (2)** appropriate models to capture the volatility of the daily returns for above index. (4 marks)

(b) Consider the following model:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \dots + \beta_k X_{kt} + u_t, \qquad u_t \sim N(0, h_t)$$
where $h_t = \alpha_0 + \alpha_1 u^2_{t-1} + \alpha_2 u^2_{t-2}$

(i) Explain the procedures and hypotheses of testing the above model with relevant steps. (9 marks)

(ii) Discuss **TWO (2)** problems that may associate with above model. (4 marks)

(iii) Suggest and specify an appropriate model that may overcome the problems as stated in part (ii). (4 marks)

[Total marks: 25 marks]

End of Paper

Formula sheet

Mean Absolute Deviation (MAD) $= \frac{\sum |d_i|}{n}$

Variance (S^2) $= \frac{\sum d_i^2}{(n-1)}$

Standard Deviation (S) $= \sqrt{S^2}$

Mean Absolute Error (MAE) $= \frac{1}{n}\sum_{i=1}^{n} |Y_{t+i} - F_{t+i}|$

Mean Square Error (MSE) $= \frac{1}{n}\sum_{i=1}^{n} (Y_{t+i} - F_{t+i})^2$

Root Mean Square Error (RMSE) $= \sqrt{MSE}$

Moving average (MA)

$MA(t|K) = \frac{Y_t + Y_{t-1} + \cdots + Y_{t-K+1}}{K}$

Simple exponential smoothing (SES)

$F_{t+1} = F_t + \alpha(Y_t - F_t)$

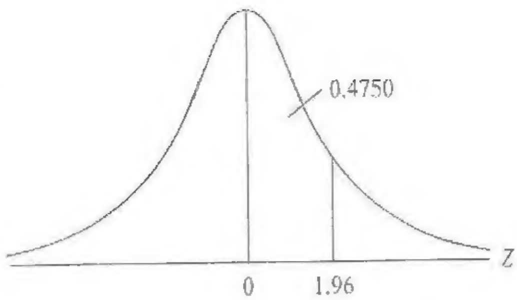
Starting value: $F_{t+1} = Y_t$

TABLE D.1
Areas Under the Standardized Normal Distribution

Example

$Pr(0 \le Z \le 1.96) = 0.4750$

$Pr(Z \ge 1.96) = 0.5 - 0.4750 = 0.025$



Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4454	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Note: This table gives the area in the right-hand tail of the distribution (i.e., $Z \ge 0$). But since the normal distribution is symmetrical about $Z = 0$, the area in the left-hand tail is the same as the area in the corresponding right-hand tail. For example, $P(-1.96 \le Z \le 0) = 0.4750$. Therefore, $P(-1.96 \le Z \le 1.96) = 2(0.4750) = 0.95$.

TABLE D.2
Percentage Points of the t Distribution

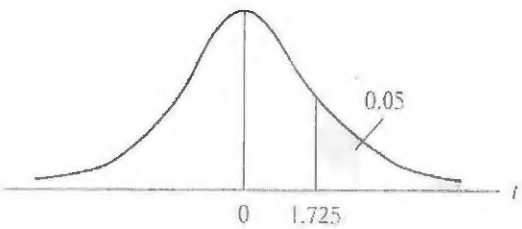
Source: From E. S. Pearson and H. O. Hartley, eds., *Biometrika Tables for Statisticians*, vol. 1, 3d ed., table 12, Cambridge University Press, New York, 1966. Reproduced by permission of the editors and trustees of *Biometrika*.

Example

$\Pr(t > 2.086) = 0.025$

$\Pr(t > 1.725) = 0.05$ for df $= 20$

$\Pr(|t| > 1.725) = 0.10$



df \ Pr	0.25 0.50	0.10 0.20	0.05 0.10	0.025 0.05	0.01 0.02	0.005 0.010	0.001 0.002
1	1.000	3.078	6.314	12.706	31.821	63.657	318.31
2	0.816	1.886	2.920	4.303	6.965	9.925	22.327
3	0.765	1.638	2.353	3.182	4.541	5.841	10.214
4	0.741	1.533	2.132	2.776	3.747	4.604	7.173
5	0.727	1.476	2.015	2.571	3.365	4.032	5.893
6	0.718	1.440	1.943	2.447	3.143	3.707	5.208
7	0.711	1.415	1.895	2.365	2.998	3.499	4.785
8	0.706	1.397	1.860	2.306	2.896	3.355	4.501
9	0.703	1.383	1.833	2.262	2.821	3.250	4.297
10	0.700	1.372	1.812	2.228	2.764	3.169	4.144
11	0.697	1.363	1.796	2.201	2.718	3.106	4.025
12	0.695	1.356	1.782	2.179	2.681	3.055	3.930
13	0.694	1.350	1.771	2.160	2.650	3.012	3.852
14	0.692	1.345	1.761	2.145	2.624	2.977	3.787
15	0.691	1.341	1.753	2.131	2.602	2.947	3.733
16	0.690	1.337	1.746	2.120	2.583	2.921	3.686
17	0.689	1.333	1.740	2.110	2.567	2.898	3.646
18	0.688	1.330	1.734	2.101	2.552	2.878	3.610
19	0.688	1.328	1.729	2.093	2.539	2.861	3.579
20	0.687	1.325	1.725	2.086	2.528	2.845	3.552
21	0.686	1.323	1.721	2.080	2.518	2.831	3.527
22	0.686	1.321	1.717	2.074	2.508	2.819	3.505
23	0.685	1.319	1.714	2.069	2.500	2.807	3.485
24	0.685	1.318	1.711	2.064	2.492	2.797	3.467
25	0.684	1.316	1.708	2.060	2.485	2.787	3.450
26	0.684	1.315	1.706	2.056	2.479	2.779	3.435
27	0.684	1.314	1.703	2.052	2.473	2.771	3.421
28	0.683	1.313	1.701	2.048	2.467	2.763	3.408
29	0.683	1.311	1.699	2.045	2.462	2.756	3.396
30	0.683	1.310	1.697	2.042	2.457	2.750	3.385
40	0.681	1.303	1.684	2.021	2.423	2.704	3.307
60	0.679	1.296	1.671	2.000	2.390	2.660	3.232
120	0.677	1.289	1.658	1.980	2.358	2.617	3.160
∞	0.674	1.282	1.645	1.960	2.326	2.576	3.090

Note: The smaller probability shown at the head of each column is the area in one tail; the larger probability is the area in both tails.